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HOUSEHOLD REFRIGERATORS WILL BE BETTER AND MORE ECONOMICAL

by S. Varenko

- USSR -

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FOREWORD

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HOUSEHOLD REFRIGERATORS WILL BE BETTER AND MORE ECONOMICAL
--USSR--

Following is a translation of an article by S. Varenko in the Russian-language periodical Sovetskaya Torgovlya (Soviet Trade), Moscow, No. 1, January 1960, pages 14-19.

Fifty years -- this is the difference between the "age" of production of household refrigerators abroad and in the Soviet Union. But in this technically very complex field Soviet industry has, in a very short time, achieved enormous success: it has caught up to and, in some respects, overtaken foreign countries.

Serial production of refrigerators in the Soviet Union began in 1951. Before that time they were produced in small batches. In this short period (up to 1959) output of household refrigerators increased more than 30-fold, and they have entered mass use.

The Central Committee of the CPSU and the Council of Ministers USSR, in the resolution "On measures to increase production, expand the variety, and improve the quality of cultural-consumer goods", determined the volume of output of household refrigerators for 1960 and 1961.

In 1961 a total of 796,000 units are to be turned out, or nearly twice as many as in 1958 and 70% more than in 1959. After the Seven-Year Plan, in 1965, production of household refrigerators will reach around 1.5 million per year. During the years of the Seven-Year Plan the population will buy 7 times more than were produced in all the years between the beginning of organization of production and the present.

Two types of household refrigerators are now being produced in the USSR: the compressor type, in which freon-12 is used as the refrigerant; and absorption-diffusion units, using ammonia.

The lion's share of total production (80%) falls to compressor refrigerators. They have better technical-operating indexes and work well in all climatic zones.

Absorption boxes, on the other hand, because of their design features, can be used only at temperatures below 30°. Therefore, as a rule, this type of household refrigerator is used only in the middle climatic zone of our country, and is not sent to the republics with hot climates.

The production of household refrigerators, particularly of the compressor type, required developments which were completely new to Soviet industry: technological processes, special equipment and tools, and the involvement of numerous contiguous factories. Therefore it is no accident that their production was assigned to the larger plants, with experience in mass-serial production, progressive technology, and experienced manpower.

All production process for household refrigerators have been considerably improved in recent years. This has permitted a great improvement in refrigerator quality.

In producing the outer shell of the box a hydraulic bending machine, specialized welding tools, and equipment are used. The refrigerators are painted with high-quality titanium enamels, with the painting done by the bonderizing process, which markedly improves the bond between paint and metal. The interior, where the food is kept, is covered with strong glass-enamels.

The use of titanium enamels permits producing extremely white boxes, making them more acid-resistant, and improves the external appearance.

A system has been developed consisting of tools and equipment for filling the refrigerating unit with freon-12 and with special oil for drying parts and joints in the equipment, hermeticizing the system, and assuring long life in the hermetic system of the compressor and electric motor.

In order to detect the flow of freon-12 in production a special instrument is used: an electronic halide-flow-detector, which can detect a freon flow with a precision of 0.5 gram per year. In producing the automatic electric equipment (relays, thermostat) special control instruments and stands are used: constant-temperature baths, an instrument determining the silfone [unidentified] force, a silfone-filling stand, etc.

On the basis of all these improvements there has been a considerable increase in labor productivity and a drop in the production cost of refrigerators.

Here are some indexes for 1959, compared with those for 1951:

<u>Index</u>	<u>1951</u>	<u>1959</u>
Output, thousands	15.0	461.0
Labor content, hours	92.0	41.0
Compressor cost, rubles	3,070	1,146
Complaints	23.3%	3%

Thus, with a sharp rise in output of household refrigerators, the quality has improved greatly, and the number of complaints has dropped more than 8-fold [sic].

These successes are the result of accumulating experience; they are indicative also of great reserves.

At present 11 factories are engaged in the production of household refrigerators. A positive feature is the fact that each of these plants specializes in the production of only one model; as a result we have created good production facilities. This also explains the sharp drop in refrigerator cost, and hence their relatively low retail prices.

It should be noted that the retail prices of household refrigerators are lower than those in foreign countries.

The production of household refrigerators, however, for those plants engaged in this work, is a secondary activity, scattered through out separate sections. There is no factory in the USSR so far which specializes in the production of household refrigerators. This has a bad effect both on the modernization of existing and on the development of new models.

All the well-known models of household refrigerators -- the ZIL-Moskva, Saratov-2, Dnepr, Sever, Sever-2, and others -- have undergone partial modernization, directed basically toward improving their economic indexes: the use of more economical electric motors and heaters, of rolled-welded aluminum evaporators instead of expensive stainless-steel parts, and the partial redesigning of individual parts (locks, shelves, etc). But the modernization done made little change in the external appearance of the refrigerators, and did not improve the useful coefficient of the boxes. The refrigerators remained essentially what they were 7-8 years ago. They are still too heavy per liter of useful volume.

The development of new models is proceeding inexcusably slowly. As long ago as 1957 the Moscow Automobile Factory imeni Likhachev and the Saratov Factory should have shifted over to production of new-model refrigerators -- the ZIL-Moskva-248 and the Saratov-3. Here are the data on them, compared with the models now being produced:

<u>Index</u>	<u>ZIL- Moskva-165</u>	<u>ZIL- Moskva-248</u>	<u>Saratov-2</u>	<u>Saratov-3</u>
Useful volume, liters	165	248	85	175
Coefficient of useful volume ...	0.3	0.48	0.23	0.42
Refrigerator weight, kg	95	94	85	95
Weight per liter of useful volume, kg	0.57	0.38	1.00	0.54
Electricity consumption per hour in box at +20°, with outside temperature +20°, per liter of useful volume per day [sic], in watt-hours	5.2	2.7	11.3	5.5
Condenser capacity, liters	12	28--30	5	20
Number of door shelves	--	3	--	3

Thus the new refrigerators, with their technical-economic indexes, useful shelf space, and external appearance considerably exceed those now being produced, and are not inferior to many foreign models of household refrigerators. The wide use of plastics in their design has permitted an almost 50% reduction in metal consumption per unit of useful volume.

The mass production of new models would also yield a great economy in electricity consumption. For example, the new ZIL-Moskva-248 model, in which new fiberglass insulation is used and which employs new electrical fittings, consumes 20% less electric power. With an annual production of 100,000 boxes (the annual program of the Moscow Automobile Factory imeni Likhachev) this will yield a power saving of around 10 million kilowatt-hours. And the factory cost of the new refrigerator is no greater than that of the 165-liter model now being produced. However, these new and promising models exist only on paper. The Saratov Factory has assigned the refrigerator to serial production, and has established a price, and, according to a Sovnarkhoz report, will begin mass production this year. Unfortunately, the Moscow Automobile Factory imeni Likhachev has not yet settled on the serial model of the new refrigerator.

The operation, under household conditions, of equipment as complex as a refrigerator, places high demands on its design.

Unlike other household electrical machinery and instruments, the refrigerator is plugged into the electricity 24 hours a day; therefore it must be economical, its parts must operate with precision, and it must automatically retain a low temperature. At the same time it cannot require any special treatment.

A refrigerator must operate without repair or the replacement of refrigerant or oil for 15-20 years.

The partial modernization of parts which has been done, and the development of new compressor designs, has considerably improved the operating qualities of refrigerators, reduced consumption of nonferrous metals and expensive materials, and increased the useful volume of the box.

But this is only the beginning. Future development in the production of household refrigerators must include the following:

- Maximum utilization of refrigerator dimensions by increasing the volume of the refrigerated chamber and improving its external shape;

- Increasing the convenience of utilization by, for instance, equipping the insides of the doors with shelves and niches; increasing the condenser volume so that foods can be frozen;

- Improving the thermal and economic indexes;

- Replacing expensive and scarce materials without reducing quality;

- Simplifying design, increasing useful life.

Models of household refrigerators in which these requirements have been included have been developed hitherto only at the Moscow and Saratov factories.

With the existing organization of refrigerator production at the enterprises of various sovnarkhozes and local industry, the management of individual design offices in the factories must be centralized.

For this purpose at one of the leading factories in the country, such as at the Moscow Automobile Factory imeni Likhachev or the Saratov Factory, which have considerable experience in the production of household refrigerators, a Central Design Office should be organized. This should be charged with developing new, more progressive models of household refrigerators, the preparation of experimental models and recommendations for their production; the development of new technological processes in the production of household refrigerators; standardization and unification of basic refrigerator parts; the development of technical specifications for refrigerators and their parts; the preparation of GOST's; research work; and the exchange of experience and technical information among factories.

Almost no one is interested in these problems, and the factories producing household refrigerators are forced to make their own solutions of design problems, frequently without taking sufficient account of achievements in the field and without constant working connection with one another.

The lack of centralized management causes the selection of antiquated models for new production. Thus last year, for example, the Tashkent Factory proceeded to manufacture the Vostok refrigerator, an absorption

refrigerator modeled after the Gazoapparat with 45 liters' capacity, which was taken out of production in Moscow because of unsatisfactory operating qualities.

A voluntary agreement of the designers of the factories producing compressor refrigerators has standardized the largest parts -- compressor, electric motor, and automatic control equipment.

But this is not the end of the work. Most parts, particularly smaller ones, remain unstandardized, have different norms. This causes needless transportation of these parts from different factories to the same parts of the country, and creates great difficulties in repairing refrigerators.

In September of last year an All-Union Conference of Workers of Factories and Sovnarkhozes was held in Saratov, together with representatives of science and interested organizations. The Conference, called by the Gosplan USSR, Gosplan RSFSR, and the Saratov Sovnarkhoz, discussed these problems widely.

The Conference's resolution made a recommendation concerning the need for creating a Central Design Office for Refrigerators. It would be desirable for this recommendation to be carried out rapidly.

The rise in the production of household refrigerators, the development of residential housing, and the gasification of residences raise new requirements for refrigerator types and designs. Therefore it is already necessary to determine what models and designs should be produced by our industry. The types of refrigerators produced should not be too numerous, and should incorporate maximum standardization of parts.

The following designs and models of household refrigerators should be recommended for production: compressor types with internal capacities of 90-120, 160-180, and 220-250 liters; and absorption types, with electric and gas heating, with capacities of 30-40, 60-100, and 160-180 liters.

In addition to low boxes, it would be desirable also to manufacture wall and built-in refrigerators. This is particularly important for small housing quarters having limited space into which to put refrigerators.

It is very important to harmonize the output of absorption refrigerators combined with gas ranges and "air boxes" [unidentified]. Samples of such refrigerators exist, but work is not being done on them with sufficient intensity. It should be noted that the Moscow Factory "Gazoapparat" had a model of a combined refrigerator two years ago; but no proposals for perfecting it have yet been advanced.

The problem of providing centralized cold for residential units is worthy of attention. In this system those units which have built-in refrigerator boxes would receive cold through piping from machinery running a huge compressor, after the fashion of central heating.

The use of this type of cold would have enormous economic advantages: it would release hundreds of thousands of electric motors and compressors, hundreds of tons of metal used in the production of refrigerator housings, and the enamel paints used to paint the outsides of the boxes, not to mention other raw materials.

However, these problems have not yet been studied. They require serious work.

In the production of new refrigerator models an important role is played by the chemical industry. The planned rapid growth in the production of plastics will help in the production of refrigerator boxes and inner linings.

They could, for example, be made as a single casting from foam-porous plastic material which, with a little treatment of the inner and outer surfaces, would keep their new appearance for a long time. Good results might also come from various combinations of plastics with metal as, for instance, in the production of the refrigerator lining and the inner door panels, by forming them as a whole from polystyrene. The inner panel could have shelves for keeping foods which do not require extreme cold -- bottled beverages, butter, eggs, etc.

Because of the low thermal conductivity of plastic such refrigerators retain cold well, consume much less electric power, and are not heavy. For instance a whole plastic absorption refrigerator with a capacity of 70 liters weighs a total of 29 kilograms; combined with metal 42 kilograms; and made of metal, with the same internal capacity, weighs more than 70 kilograms.

Such models are worthy of the serious attention of factories producing absorption-type refrigerators. They can be used quite effectively in republics with hot climates, since temperature changes have no great effect on the normal operation of the refrigerating equipment.

In this article I should also like to mention a few points concerning the organization of repair of refrigerators, and provisions for securing spare parts. As the output of household refrigerators increases sharply there will also be a sudden increase in the number of owners of them. Therefore it is already necessary to take decisive measures to make the process of repairs during and after the guarantee period orderly.

Despite the fact that in recent years the quality of refrigerators has improved considerably, while the number of complaints has dropped sharply, repairs during and particularly after the guarantee period still remain unsatisfactory.

For example, the Moscow enterprises such as the Automobile Factory imeni Likhachev and the "Gazoapparat" plant have only one guarantee workshop apiece. The Saratov Factory has two such shops. At the same time there are 12 repair shops in Moscow belonging to the Administration of Local Industry of the Moscow City Executive Committee; they repair refrigerators after the guarantee has expired. They are not interested in repairs during the guarantee period.

In most regional centers of the RSFSR and the union republics the guarantee repair of refrigerators is done by all sorts of organizations under the ministries of trade of the republics, local industry, industrial cooperatives, sovnarkhozes, etc.

This sort of scattering of repair facilities has a bad effect on work quality.

Most shops do not have the necessary equipment and simply do not accept many types of repair work. This forces the factories to keep traveling mechanics on their staffs, who frequently fly by airplane to settle the resulting conflicts.

The network of repair shops is very small. A consumer living in a city where there is no refrigerator-repair shop is forced, when he discovers defects in manufacture, to enter into a protracted correspondence with the producing factory, and then send the particular part or the entire refrigerator back to the factory.

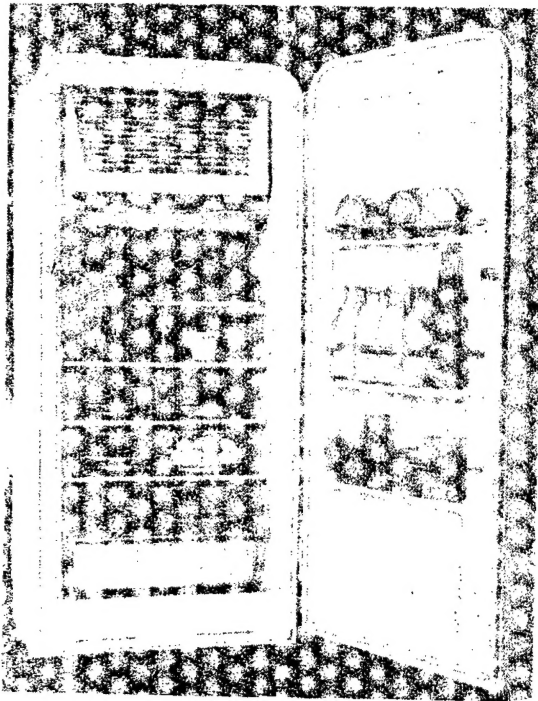
This business must be straightened out. A wide network of shops must be set up to make repairs to refrigerators and other complicated household machinery and tools. A good example in this respect is the Gosradiotrest [State Radio Trust], now operating, which handles the guarantee and post-guarantee repair of radios and television equipment.

The creation of an all-union trust for repairing household machinery and tools would reduce the cost of maintaining the repair shops, would permit the use of standard designs in their organization, and would improve the centralized supply of the shops with spare parts and the necessary equipment. Under these conditions it will also be easier to organize the training of skilled mechanics.

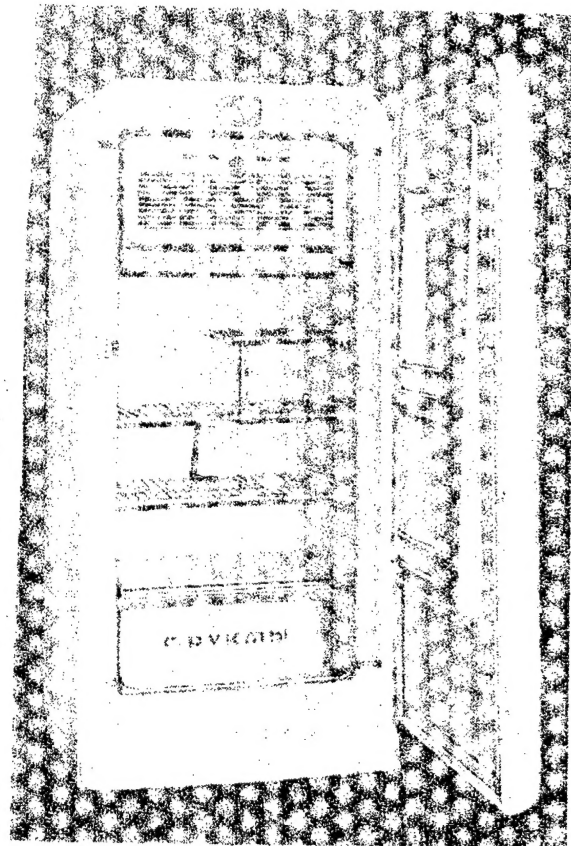
The creation of an all-union trust will help to bring order into the planning of production of spare parts and supplying them to various parts of the country. The problems raised in this article require, in our opinion, serious consideration and immediate solution.

This will contribute to the fulfillment of the resolution of the Central Committee, CPSU and the Council of Ministers USSR, and will make it possible to give our people convenient and modern models of household refrigerators in the necessary variety and good quality.

Figure Appendix



1. New "ZIL-Moskva-248"
Refrigerator



2. New "Saratov-3"
Refrigerator